

Abdominal aortic aneurysm: diagnosis and management

NICE guideline

Draft for consultation, May 2018

This guideline covers diagnosing and managing abdominal aortic aneurysms. It aims to improve care by helping people who are at risk to get tested, specifying how often to monitor asymptomatic aneurysms, and identifying when aneurysm repair is needed and which procedure will work best.

Who is it for?

- Healthcare professionals
- Commissioners and providers
- People with an abdominal aortic aneurysm, their families and carers

This version of the guideline contains:

- the draft recommendations
- rationale and impact sections that explain why the committee made the recommendations and how they might affect practice
- the guideline context
- recommendations for research.

This guideline will update NICE technology appraisal guidance 167 (published February 2009).

Information about how the guideline was developed is on the [guideline's page](#) on the NICE website. This includes the evidence reviews, the scope, and details of the committee and any declarations of interest.

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24 **Recommendations**

[Making decisions using NICE guidelines](#) explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

25 1.1 ***Diagnosis***

26 **Identifying people at risk of abdominal aortic aneurysms**

27 1.1.1 Tell all men aged 66 and over who have not already been screened about
28 the NHS AAA screening programme, and advise them that they can self-
29 refer.

30 1.1.2 Encourage men aged 66 or over to self-refer to the NHS abdominal aortic
31 aneurysm (AAA) screening programme if they have not already been
32 screened and they have any of the following risk factors:

- 33 • chronic obstructive pulmonary disease (COPD)
- 34 • coronary, cerebrovascular or peripheral arterial disease
- 35 • European family origin
- 36 • family history of AAA
- 37 • hyperlipidaemia
- 38 • hypertension
- 39 • they smoke or used to smoke.

40 1.1.3 Consider an aortic ultrasound for women aged 70 and over if AAA has not
41 already been excluded on abdominal imaging and they have any of the
42 following risk factors:

- 43 • COPD
- 44 • coronary, cerebrovascular or peripheral arterial disease
- 45 • European family origin
- 46 • family history of AAA

- 47 • hyperlipidaemia
- 48 • hypertension
- 49 • they smoke or used to smoke.

50 **Identifying asymptomatic abdominal aortic aneurysms**

51 1.1.4 Offer an aortic ultrasound to people in whom a diagnosis of asymptomatic
52 AAA is being considered if they are not already in the NHS screening
53 programme.

- 54 • Refer people with an abdominal aorta diameter of 5.5 cm or larger to a
55 regional vascular service, to be seen within 2 weeks of diagnosis.
- 56 • Refer people with an abdominal aorta diameter of 3–5.4 cm to a
57 regional vascular service, to be seen within 12 weeks of diagnosis.

58 1.1.5 Offer an aortic ultrasound to people with a suspected AAA on abdominal
59 palpation.

To find out why the committee made the recommendations on identifying people at risk of AAAs and identifying asymptomatic AAAs and how they might affect practice, see [rationale and impact](#).

60 **Identifying symptomatic or ruptured abdominal aortic aneurysms**

61 1.1.6 Think about the possibility of ruptured AAA in people with new abdominal
62 and/or back pain, cardiovascular collapse, or loss of consciousness. Be
63 aware that ruptured AAA is particularly likely if they also have any of the
64 following risk factors:

- 65 • an existing diagnosis of AAA
- 66 • age over 60
- 67 • they smoke or used to smoke
- 68 • history of hypertension.

69 1.1.7 Be aware that AAAs are more likely to rupture in women than men.

- 70 1.1.8 Offer an immediate bedside aortic ultrasound to people in whom a
71 diagnosis of symptomatic and/or ruptured AAA is being considered.
72 Discuss immediately with a regional vascular service if:
- 73 • the ultrasound shows an AAA **or**
 - 74 • the ultrasound is not immediately available or it is non-diagnostic, and
 - 75 an AAA is still suspected.

To find out why the committee made the recommendations on identifying symptomatic or ruptured AAAs and how they might affect practice, see [rationale and impact](#).

76 **Imaging technique**

- 77 1.1.9 When measuring aortic size with ultrasound, report anterior-posterior
78 inner-to-inner diameter as a minimum, in accordance with the NHS AAA
79 screening programme. Clearly document any additional measurements
80 taken.
- 81 1.1.10 For people with an abdominal aorta diameter of 5.5 cm or larger who are
82 being evaluated for elective surgery, offer thin-slice contrast-enhanced
83 arterial-phase CT angiography.
- 84 1.1.11 For people with a suspected ruptured AAA who are being evaluated for
85 surgery, consider thin-slice contrast-enhanced arterial-phase CT
86 angiography.

To find out why the committee made the recommendations on imaging technique and how they might affect practice, see [rationale and impact](#).

87

88 1.2 ***Emergency transfer to regional vascular services***

- 89 1.2.1 Be aware that there is no single symptom, sign or prognostic risk
90 assessment tool that determines whether people with a suspected or
91 confirmed ruptured abdominal aortic aneurysm (AAA) should be
92 transferred.

- 93 1.2.2 When making transfer decisions, be aware that people with a confirmed
94 ruptured AAA who have a cardiac arrest and/or have a persistent loss of
95 consciousness (in the emergency department or during transfer) have a
96 negligible chance of surviving AAA repair.
- 97 1.2.3 For guidance on care of people with a ruptured AAA for whom repair is
98 considered inappropriate, see the NICE guideline on [care of dying adults](#)
99 [in the last days of life](#).
- 100 1.2.4 When people with a suspected ruptured or symptomatic unruptured AAA
101 have been accepted by a regional vascular service for emergency
102 assessment, ensure that they leave the referring unit within 30 minutes of
103 the decision to transfer.
- 104 1.2.5 Emergency departments, ambulance services and regional vascular
105 services should collaborate to:
- 106 • provide a protocol for the safe and rapid transfer of people with a
107 suspected ruptured or symptomatic unruptured AAA who need
108 emergency assessment at a regional vascular service
 - 109 • train clinical staff involved in the care of people with a suspected
110 ruptured or symptomatic unruptured AAA in the transfer protocol
 - 111 • review the transfer protocol at least every 3 years.

To find out why the committee made the recommendations on emergency transfer to regional vascular services and how they might affect practice, see [rationale and impact](#).

112 **Supporting people during transfer**

- 113 1.2.6 Consider a restrictive approach to volume resuscitation ([permissive](#)
114 [hypotension](#)) for people with a suspected ruptured or symptomatic AAA
115 during emergency transfer to a regional vascular service.

To find out why the committee made the recommendation on supporting people during transfer and how it might affect practice, see [rationale and impact](#).

116 1.3 ***Monitoring and reducing the risk of rupture***

117 **Reducing the risk of rupture**

118 1.3.1 Offer a referral to a stop smoking service to people with an abdominal
119 aortic aneurysm (AAA) who smoke. For more guidance, see the NICE
120 guideline on [stop smoking interventions and services](#).

121 1.3.2 Ensure that people with an AAA who have hypertension receive care in
122 line with the NICE guideline on [hypertension in adults](#).

To find out why the committee made the recommendations on reducing the risk of rupture and how they might affect practice, see [rationale and impact](#).

123 **Monitoring the risk of rupture**

124 1.3.3 Offer surveillance with aortic ultrasound to people with an asymptomatic
125 AAA:

- 126 • every 3 months if the AAA is 4.5–5.4 cm
- 127 • every 2 years if the AAA is 3.0–4.4 cm.

128 1.3.4 See recommendation 1.1.4 on when to refer people to a regional vascular
129 unit.

To find out why the committee made the recommendations on monitoring the risk of rupture and how they might affect practice, see [rationale and impact](#).

130 1.4 ***Predicting and improving surgical outcomes***

131 **Predicting surgical outcomes for unruptured aneurysms**

132 1.4.1 Consider cardiopulmonary exercise testing when assessing people for
133 elective repair of an asymptomatic abdominal aortic aneurysm (AAA), if it
134 will assist in shared decision-making.

135 1.4.2 For guidance on other preoperative tests, see the NICE guideline on
136 [routine preoperative tests for elective surgery](#).

137 1.4.3 Do not use the following risk assessment tools in shared decision-making
138 for elective repair of an asymptomatic unruptured AAA:

- 139 • Comorbidity Severity Score
- 140 • Glasgow Aneurysm Scale
- 141 • Medicare risk prediction tool
- 142 • Modified Leiden score
- 143 • Physiological and Operative Severity Score for enUmeration of
144 Mortality (POSSUM)
- 145 • Vascular-POSSUM
- 146 • Vascular Biochemical and Haematological Outcome Model (VBHOM)
- 147 • Vascular Governance North West (VGNW) risk model.

To find out why the committee made the recommendations on predicting surgical outcomes for unruptured aneurysms and how they might affect practice, see [rationale and impact](#).

148 **Predicting surgical outcomes for ruptured aneurysms**

149 1.4.4 Do not use any single symptom, sign or patient-related risk factor to
150 determine whether aneurysm repair is suitable for a person with a
151 ruptured AAA.

152 1.4.5 Do not use patient risk assessment tools (scoring systems) to determine
153 whether aneurysm repair is suitable for a person with a ruptured AAA.

To find out why the committee made the recommendations on predicting surgical outcomes for ruptured aneurysms and how they might affect practice, see [rationale and impact](#).

154 **Improving surgical outcomes**

155 1.4.6 Offer people with an AAA information, support and interventions for
156 secondary prevention of cardiovascular disease. For more information
157 refer to the NICE guidance on:

- 158 • [stop smoking interventions and services](#)

- 159 • [diet, weight management](#) and [exercise](#)
160 • [medicines optimisation](#)
161 • [lipid modification and statin therapy](#)
162 • [diabetes management](#)
163 • [hypertension diagnosis and management](#)
164 • antiplatelet therapy.
- 165 1.4.7 Do not routinely start beta blockers immediately before surgery for people
166 having aneurysm repair.
- 167 1.4.8 Do not offer remote ischaemic preconditioning to people having aneurysm
168 repair.
- 169 1.4.9 For guidance on preventing and treating surgical site infections and on
170 preventing venous thromboembolism, see the NICE guidelines on [surgical](#)
171 [site infections](#) and [reducing the risk of venous thromboembolism](#).

To find out why the committee made the recommendations on improving surgical outcomes and how they might affect practice, see [rationale and impact](#).

- 172 1.5 ***Repairing unruptured aneurysms***
- 173 1.5.1 Consider aneurysm repair for people with an unruptured abdominal aortic
174 aneurysm (AAA), if it is:
- 175 • symptomatic
176 • asymptomatic and 5.5 cm or larger
177 • asymptomatic, larger than 4.0 cm and has grown by more than 1 cm in
178 1 year.
- 179 1.5.2 For people with unruptured AAAs meeting the criteria in 1.5.1, offer open
180 surgical repair unless there are anaesthetic or medical contraindications.
- 181 1.5.3 Do not offer endovascular repair (EVAR) to people with an unruptured
182 [infrarenal AAA](#) if open surgical repair is suitable.

183 1.5.4 Do not offer EVAR to people with an unruptured infrarenal AAA if open
184 surgical repair is unsuitable because of their anaesthetic and medical
185 condition.

186 1.5.5 Do not offer [complex EVAR](#) to people with an unruptured AAA if open
187 surgical repair is a suitable option, except as part of a randomised
188 controlled trial comparing complex EVAR with open surgical repair.

189 1.5.6 Do not offer complex EVAR to people with an unruptured AAA if open
190 surgical repair is unsuitable because of their anaesthetic and medical
191 condition.

To find out why the committee made the recommendations on repairing unruptured aneurysms and how they might affect practice, see [rationale and impact](#).

192 **Anaesthesia and analgesia**

193 1.5.7 Consider epidural analgesia in addition to general anaesthesia for people
194 having open surgical repair of an unruptured AAA.

To find out why the committee made the recommendations on anaesthesia and analgesia for repair of unruptured aneurysms and how they might affect practice, see [rationale and impact](#).

195 1.6 ***Repairing ruptured aneurysms***

196 1.6.1 Consider endovascular repair (EVAR) or open surgical repair for people
197 with a ruptured [infrarenal](#) abdominal aortic aneurysm (AAA). Be aware
198 that:

- 199 • EVAR provides more benefit than open surgical repair for most people,
200 especially for women and for men over the age of 70
- 201 • open surgical repair is likely to provide a better balance of benefits and
202 harms in men under the age of 70.

203 1.6.2 Consider open surgical repair for people with a ruptured complex AAA.

- 204 1.6.3 Do not offer [complex EVAR](#) to people with a ruptured AAA if open surgical
205 repair is suitable, except as part of a randomised controlled trial
206 comparing complex EVAR with open surgical repair.

To find out why the committee made the recommendations on repairing ruptured aneurysms and how it might affect practice, see [rationale and impact](#).

207 **Anaesthesia and analgesia**

- 208 1.6.4 Consider using local infiltrative anaesthesia alone for people having EVAR
209 of a ruptured AAA.

To find out why the committee made the recommendation on anaesthesia and analgesia and how it might affect practice, see [rationale and impact](#).

210 **Abdominal compartment syndrome**

- 211 1.6.5 Be aware that people can develop abdominal compartment syndrome
212 after EVAR or open surgical repair of a ruptured AAA.
- 213 1.6.6 Assess people for abdominal compartment syndrome if their condition
214 does not improve after EVAR or open surgical repair of a ruptured AAA.

To find out why the committee made the recommendations on abdominal compartment syndrome and how they might affect practice, see [rationale and impact](#).

215 1.7 ***Monitoring for complications after endovascular aneurysm*** 216 ***repair***

- 217 1.7.1 Enrol people who have had endovascular aneurysm repair (EVAR) into a
218 surveillance imaging programme.
- 219 1.7.2 Base the frequency of surveillance imaging on the person's risk of graft-
220 related complications.
- 221 1.7.3 Use contrast-enhanced CT angiography to detect postoperative
222 complications and further aneurysm expansion.

223 1.7.4 If contrast-enhanced CT angiography is contraindicated, consider
224 contrast-enhanced ultrasound to detect [endoleaks](#) and further aneurysm
225 expansion.

226 1.7.5 Do not use colour duplex ultrasound as the main imaging technique to
227 detect endoleaks in people who have had an EVAR.

To find out why the committee made the recommendations on monitoring for complications after endovascular aneurysm repair and how they might affect practice, see [rationale and impact](#).

228 1.8 ***Managing endoleaks after endovascular aneurysm repair***

229 1.8.1 Consider open, endovascular or percutaneous intervention for type I and
230 type III [endoleaks](#) following endovascular aneurysm repair (EVAR).

231 1.8.2 Consider intervention for type II endoleaks in people who have sac
232 expansion following EVAR.

233 1.8.3 Consider further investigation of type V endoleaks following EVAR.

To find out why the committee made the recommendations on managing endoleaks after endovascular repair and how they might affect practice, see [rationale and impact](#).

234

235 ***Terms used in this guideline***

236 This section defines terms that have been used in a specific way for this guideline.
237 For general definitions, please see the [glossary](#).

238 **Complex EVAR**

239 Any endovascular strategy that is outside the 'instructions for use' of aortic stent-
240 grafts, typically adopted because of an AAA's anatomical complexity. This includes
241 using unmodified endografts outside their 'instructions for use', physician-modified
242 endografts, customised fenestrated endografts, and 'snorkel' or 'chimney'
243 approaches with parallel covered stents.

244 **Endoleak**

245 The persistence of blood flow outside an endovascular stent-graft but within the
246 aneurysm sac in which the graft is placed. There are 5 types of endoleak:

- 247 • Type I – blood flowing into the aneurysm because of an incomplete or ineffective
248 seal at either end of an endograft.
- 249 • Type II – blood flowing into the sac from small side branches of the aorta.
- 250 • Type III – blood flowing into the aneurysm sac through defects in the endograft.
- 251 • Type IV – blood flowing through the graft fabric into the aneurysm sac.
- 252 • Type V – continued sac expansion without radiographic evidence of a leak site.

253 **Infrarenal AAA**

254 An aneurysm located in the lower segment of the abdominal aorta, below the arteries
255 that supply the kidneys.

256 **Permissive hypotension**

257 A method of fluid administration that aims to reduce bleeding by keeping a person's
258 blood pressure within a lower-than-normal range.

259 **Recommendations for research**

260 The guideline committee has made the following recommendations for research.

261 ***Key recommendations for research***

262 **1 Monitoring frequencies and repair thresholds**

263 What are the most effective and cost effective frequencies for monitoring people with
264 unruptured abdominal aortic aneurysms (AAA) of different diameters, and what is the
265 optimal threshold for repair?

266 ***Why this is important***

267 More frequent monitoring increases the chances of identifying aneurysms that have
268 grown large enough to need repair. However, monitoring requires resources and the
269 absolute risk of AAA rupture is relatively low, so there are opportunity costs to
270 consider. Effective planning is important to maximise surgical outcomes and to
271 ensure that the greatest benefit is obtained for the person with an AAA whilst posing

272 the least potential harm. It is important to establish how often aneurysms should be
273 monitored to keep the risk of rupture as low as possible while making the best use of
274 NHS resources.

275 **2 Effectiveness of endovascular aneurysm repair and open surgical repair of** 276 **unruptured and ruptured abdominal aortic aneurysms**

277 What is the effectiveness and cost effectiveness of complex endovascular aneurysm
278 repair (EVAR) versus open surgical repair in people for whom open surgical repair is
279 suitable for:

- 280 • elective repair of an unruptured AAA or
- 281 • emergency repair of a ruptured AAA?

282 ***Why this is important***

283 EVAR is a widely performed non-invasive alternative to open surgical repair.
284 However, it is more expensive. Although EVAR has been shown to produce no long-
285 term benefit over open surgical repair in people with unruptured infrarenal
286 aneurysms, it is less clear whether this is the same in people with unruptured or
287 ruptured juxtarenal, suprarenal type IV, and short-necked infrarenal aneurysms. As a
288 result, research is needed to identify how effective complex EVAR is in these
289 populations.

290 **3 Macrolides for slowing aneurysm growth and reducing the risk of rupture**

291 What are the benefits and harms of macrolides (such as azithromycin) for reducing
292 AAA growth rates and the risk of rupture?

293 ***Why this is important***

294 Small AAAs are currently managed by monitoring, until the aneurysm reaches a
295 diameter at which surgical repair is needed. There are currently no non-surgical
296 interventions available to prevent AAAs from growing, and subsequently rupturing.
297 Clinical research in this area would be useful for developing a secondary prevention
298 strategy to prevent rupture.

299 **4 Metformin for slowing aneurysm growth and reducing the risk of rupture**

300 What are the benefits and harms of metformin for reducing AAA growth rates and the
301 risk of rupture?

302 ***Why this is important***

303 Observational study data suggests an association between diabetes and slower
304 aneurysm growth, and it has been proposed that this is caused by taking metformin.
305 Randomised controlled trials are needed to determine whether metformin reduces
306 the rate of aneurysm growth.

307 **5 Tranexamic acid for preventing and treating excessive blood loss during**
308 **EVAR or open surgical repair**

309 Does tranexamic acid improve survival in people who are having repair (EVAR or
310 open surgical repair) of a ruptured AAA?

311 ***Why this is important***

312 Tranexamic acid is used to reduce blood loss in major trauma, postpartum bleeding
313 and surgery. As a result, it could benefit people with a ruptured AAA. By slowing
314 down blood loss from a ruptured aneurysm, the use of tranexamic acid could give
315 emergency services more time to transfer a patient to regional vascular services,
316 and regional vascular services more time to repair the ruptured aneurysm.

317 **6 Preoperative exercise programmes for improving the outcome of aneurysm**
318 **repair**

319 What is the clinical effectiveness and cost effectiveness of preoperative exercise
320 programmes for improving outcomes of people who are having repair of an AAA?

321 ***Why this is important***

322 NHS providers have started devoting resources to exercise programmes, based on a
323 relatively small body of evidence. Further research on the effectiveness of these
324 programmes is needed to inform funding decisions.

325 ***Other recommendations for research***

326 **Direct oral anticoagulants after AAA repair**

327 What are the benefits of postoperative use of Direct Oral Anticoagulants (DOACS)
328 for improving outcomes after repair of AAA?

329 **Transfer to specialist vascular units**

330 Within what time period should people with suspected ruptured or symptomatic
331 unruptured abdominal aortic aneurysms be transferred from a non-specialist setting
332 to a specialist vascular unit?

333 **Permissive hypotension**

334 Does permissive hypotension improve survival or improve the stability of patients
335 undergoing repair of ruptured AAA?

336 **Surveillance after endovascular aneurysm repair**

337 What are the risks, benefits and cost implications of different surveillance protocols
338 in people who have undergone EVAR?

339 Which device and patient related variables can be used in a risk model to inform
340 amendments to surveillance frequencies and modalities in patients who have
341 undergone EVAR?

342 **Rationale and impact**

343 These sections briefly explain why the committee made the recommendations and
344 how they might affect practice. They link to details of the evidence and a full
345 description of the committee's discussion.

346 ***Identifying asymptomatic abdominal aortic aneurysms***

347 Recommendations [1.1.1–1.1.5](#)

348 **Why the committee made the recommendations**

349 The committee were mindful that some men and all women who are at risk of AAA
350 are not seen by the NHS AAA screening programme. The recommendations

351 highlight these groups and specify risk factors significantly associated with AAA that
352 could be used to facilitate opportunistic screening.

353 Aortic ultrasound is recommended because it is the standard technique used in
354 clinical practice. It has high diagnostic accuracy, and is associated with lower costs
355 and fewer side effects than CT. People with an AAA diameter of 5.5 cm or larger
356 need to be seen by a regional vascular service within 2 weeks because their
357 aneurysm is at high risk of rupture. The risk is lower in people with smaller AAAs, so
358 they do not need to be seen as urgently.

359 **How the recommendations might affect practice**

360 The recommendations outlining key risk factors will increase the number of people
361 being screened and improve the chances of diagnosing the condition early, before
362 complications develop. This, in turn, may reduce associated costs and minimise the
363 risk of AAA-related mortality. The recommendations should also promote equal
364 access to healthcare, as they provide guidance on when a diagnosis of AAA should
365 be investigated in women, who are not covered by the NHS AAA screening
366 programme.

367 Using aortic ultrasound to detect AAAs is good practice. The recommendations
368 ensure that the time within which people with newly-identified aneurysms are seen
369 by regional vascular services is proportional to the risk of rupture. These timings
370 reflect current expectations within the NHS AAA screening programme.

371 Full details of the evidence and the committee's discussion are in [evidence review A:
372 Risk factors for predicting presence of an abdominal aortic aneurysm](#) and [evidence
373 review B: Imaging techniques to diagnose abdominal aortic aneurysms](#).

374 [Return to recommendations](#)

375 ***Identifying symptomatic or ruptured abdominal aortic aneurysms***

376 Recommendations [1.1.6–1.1.8](#)

377 **Why the committee made the recommendations**

378 Based on their own experience, the committee highlighted the most important signs
379 and symptoms of ruptured AAAs, because:

- 380 • non-specialists commonly misdiagnose them
- 381 • reducing misdiagnosis should increase the chance of survival
- 382 • urgent discussion of a suspected ruptured AAA with a regional vascular service
- 383 will improve the chances of appropriate treatment and survival.

384 Aortic ultrasound is the standard technique for detecting ruptured AAA. A ruptured
385 AAA is a medical emergency, and bedside ultrasound is the quickest reliable method
386 to confirm the presence of an AAA. An immediate discussion with the regional
387 vascular unit ensures appropriate treatment is started as soon as possible. The
388 committee recognised that the sensitivity of aortic ultrasound is not 100% and
389 several factors can make it difficult to visualise the aorta. Since AAA rupture is a life-
390 threatening medical emergency, they agreed that it would be safest to discuss any
391 non-diagnostic ultrasound findings with the regional vascular unit.

392 **How the recommendations might affect practice**

393 There is variation in awareness of AAAs among non-specialists. Implementing the
394 recommendations should reduce this variation and increase the chance of ruptured
395 AAAs being diagnosed earlier.

396 Using bedside aortic ultrasound to detect AAAs is common practice. Preventing
397 delays in treatment through immediate discussions with a regional vascular unit
398 should improve outcomes for people with ruptured AAAs.

399 Full details of the evidence and the committee's discussion are in [evidence review B:
400 Imaging techniques to diagnose abdominal aortic aneurysms](#) and [evidence review N:
401 Signs, symptoms and risk factors predicting ruptured or symptomatic unruptured
402 aneurysms before arrival at the hospital, and in non-specialist hospital settings.](#)

403 [Return to recommendations](#)

404 ***Imaging technique***

405 Recommendations [1.1.9–1.1.11](#):

406 **Why the committee made the recommendations**

407 There was no clear evidence on which approach to AAA sizing is the best. The
408 Committee agreed that it was important to take consistent measurements for

409 aneurysm sizing, so that the results of different tests are comparable. The NHS AAA
410 screening programme specifies a preferred measurement, and the committee
411 agreed this would be the most appropriate one to use in practice.

412 The committee recommended thin-slice contrast-enhanced arterial-phase CT
413 angiography for imaging in people being evaluated for elective surgery, as it is widely
414 recognised as the gold standard technique for measuring aneurysm size and
415 anatomy before repair. For suspected ruptured AAAs, CT angiography should also
416 be considered; however, the committee recognised that in certain patients, the
417 clinical presentation may mean vascular specialists consider that immediate transfer
418 for open repair is necessary without first obtaining a CT scan.

419 No evidence was found demonstrating whether or not post-processing techniques
420 affected postoperative outcomes of people having elective or emergency AAA repair
421 surgery. As post-processing techniques are an established part of clinical practice,
422 the committee agreed not to make recommendations in this area.

423 **How the recommendations might affect practice**

424 Implementing a consistent minimum measurement to be used across the NHS will
425 improve the reproducibility of results, improving surveillance for individuals people
426 with AAA and the ability to analyse data at the population level.

427 Thin-slice contrast-enhanced arterial-phase CT angiography is widely used for
428 imaging in people being evaluated for AAA repair, so this recommendation is unlikely
429 to make a major difference to current practice. The recommended timings reflect
430 current expectations within the NHS AAA screening programme.

431 As post-processing techniques are established in practice, a lack of
432 recommendations on these will not have an impact.

433 Full details of the evidence and the committee's discussion are in [evidence review B:
434 Imaging techniques to diagnose abdominal aortic aneurysms](#).

435 [Return to recommendations](#)

436 ***Emergency transfer to regional vascular services***

437 Recommendations [1.2.1–1.2.5](#)

438 **Why the committee made the recommendations**

439 There was no evidence on symptoms, signs or risk assessment tools for deciding
440 whether people with ruptured aneurysms are likely to survive transfer to regional
441 vascular services. Based on their own experience, the committee highlighted specific
442 circumstances in which people are unlikely to survive transfer and subsequent aortic
443 repair. This will help reduce the number of people being given ineffective and
444 invasive treatment at the end of life.

445 The committee referred to the NICE guideline on [care of dying adults in the last days
446 of life](#) to ensure that appropriate and compassionate care is given to people with
447 ruptured AAA when the decision has been made not to operate.

448 There was also no evidence on how quickly people should be transferred to regional
449 vascular units. In the absence of evidence, the committee adapted recommendations
450 from the NICE guideline on [service delivery for major trauma](#). They agreed, based
451 on their experience of emergency transfer, that the timing specified for people with
452 major trauma was appropriate for people with AAA and manageable for referring
453 units.

454 **How the recommendations might affect practice**

455 The recommendations on assessing people for transfer will raise awareness among
456 emergency staff, but will have little impact on clinical practice.

457 The NICE guidelines on care of dying adults cover current practice, so organisations
458 are unlikely to need to change practice.

459 The recommendations on transfer speed will minimise variations in transfer times
460 across the NHS. The timeframe recommended is the same as for major trauma, and
461 the committee agreed that this is a reasonably similar situation.

462 Full details of the evidence and the committee's discussion are in [evidence review O:
463 Signs, symptoms and risk factors indicating suitability for transfer to a regional](#)

464 [vascular service](#) and [evidence review P: Time period for transfer to regional vascular](#)
465 [services](#).

466 [Return to recommendations](#)

467 ***Supporting people during transfer***

468 Recommendation [1.2.6](#):

469 **Why the committee made the recommendations**

470 As there was no evidence specific to the use of permissive hypotension during
471 transfer of people with ruptured or symptomatic AAA, the committee agreed that a
472 consensus recommendation was needed in this important clinical area. As a result it
473 adapted recommendations from the NICE guideline on [assessment and initial](#)
474 [management for major trauma](#).

475 **How the recommendations might affect practice**

476 The recommendation will reduce the likelihood of inappropriate fluid administration
477 during transfer of people with ruptured AAA between hospitals. This, in turn, will
478 improve the outcomes of endovascular aneurysm repair and open surgical repair
479 procedures. The recommendation is in line with NICE recommendations on fluid
480 administration for other major trauma, and the committee agreed that this is a
481 reasonably similar situation.

482 Full details of the evidence and the committee's discussion are in [evidence review Q:](#)
483 [Permissive hypotension during transfer of people with ruptured AAA to regional](#)
484 [vascular services](#).

485 [Return to recommendations](#)

486 ***Reducing the risk of rupture***

487 Recommendations [1.3.1](#) and [1.3.2](#)

488 **Why the committee made the recommendations**

489 Based on the evidence, the committee agreed that none of the risk factors
490 associated with AAA growth or rupture would affect monitoring frequency or help
491 surgeons decide when to operate. As a result, the committee focused on modifiable

492 risk factors that could influence the management of people with known AAAs. There
493 was some evidence that high blood pressure increases the chance of AAA growth
494 and rupture, and the committee knew from their own experience that people with an
495 AAA do not always receive appropriate management for high blood pressure. There
496 is also evidence that smoking increases the risk of AAA rupture. As a result, the
497 committee referred to the NICE guidelines on these topics.

498 The committee agreed that there was not enough high-quality evidence to make
499 clinical recommendations on non-surgical interventions for slowing aneurysm growth
500 and reducing the risk of rupture. In light of this, they made research
501 recommendations on 2 promising non-surgical interventions that they believed would
502 have a positive impact on reducing aneurysm growth.

503 **How the recommendations might affect practice**

504 The NICE guidelines on hypertension and stop smoking services cover current
505 practice, so organisations are unlikely to need to change practice.

506 Non-surgical interventions for small AAAs are not usually used outside of clinical
507 trials, so a lack of recommendations will have little impact on practice.

508 Full details of the evidence and the committee's discussion are in [evidence review C:
509 Risk factors associated with abdominal aortic aneurysm growth or rupture](#).

510 [Return to recommendations](#)

511 ***Monitoring the risk of rupture***

512 Recommendations [1.3.3 and 1.3.4](#)

513 **Why the committee made the recommendations**

514 The committee recommended ultrasound surveillance every 3 months for people
515 with asymptomatic AAAs of 4.5–5.4 cm in diameter because:

- 516 • ultrasound is current practice and no evidence was found for other imaging
517 techniques (CT, MRI or wall stress analysis)

- 518 • monitoring every 3 months is current practice for people with aneurysms of this
519 size, and there was evidence that this frequency of monitoring offers the best
520 balance between benefits and costs.

521 The committee recommended ultrasound surveillance every 2 years for people with
522 asymptomatic AAAs of 3–4.4 cm in diameter because:

- 523 • ultrasound is current practice and no evidence was found for other imaging
524 techniques (CT, MRI or wall stress analysis)
525 • the absolute risk of aneurysm rupture is low and so monitoring yearly (which is
526 current practice) offers few benefits over monitoring every 2 years
527 • monitoring every 2 years offers the best balance between benefits and costs.

528 **How the recommendations might affect practice**

529 People with small AAAs (3.0–4.4 cm) currently have an aortic ultrasound every year.
530 Changing this to every 2 years should reduce costs to the NHS.

531 Full details of the evidence and the committee’s discussion are in [evidence review D:
532 Monitoring for abdominal aortic aneurysm expansion and risk of rupture](#).

533 [Return to recommendations](#)

534 ***Predicting surgical outcomes in unruptured aneurysms***

535 Recommendations [1.4.1–1.4.3](#)

536 **Why the committee made the recommendations**

537 There was limited evidence that cardiopulmonary exercise testing can help identify
538 people who are at risk of dying within 30 days and within 90 days of aneurysm
539 repair. While the evidence was limited, the committee agreed that cardiopulmonary
540 exercise testing can help with shared decision-making between healthcare
541 professionals and patients when the benefits and harms of surgery are uncertain.
542 For example, it can identify people who are at high risk during surgery, and
543 encourage discussions about the precautions needed to reduce these risks.

544 There are other tests for assessing people before surgery, but there was no
545 evidence available for them. One study found that higher estimated glomerular

546 filtration rate (eGFR) was associated with improved outcomes after elective EVAR,
547 but it did not give clear eGFR thresholds that could be used in decision-making. In
548 the absence of evidence, the committee referred to the NICE guideline on [routine](#)
549 [preoperative tests for elective surgery](#). Some of the studies reviewed for that
550 guideline focused on people having elective AAA repair.

551 The evidence highlighted that none of the risk assessment tools had a high enough
552 predictive accuracy at predicting postoperative outcomes. This led the committee to
553 conclude that these tools would not improve decision-making and could potentially
554 lead to inappropriate decisions about patient management. They agreed that this
555 could lead to harm, and therefore advised that risk assessment tools should not be
556 used.

557 **How the recommendations might affect practice**

558 Cardiopulmonary exercise testing is likely to have an impact on the decision to
559 undertake elective AAA repair, as it indicates that perioperative risks need to be
560 taken into consideration. The use of cardiopulmonary exercise testing will have
561 limited impact on practice as it is only recommended in situations where it will help in
562 shared decision-making.

563 Risk assessment tools are not widely used outside the context of research.

564 Therefore, the recommendations will have little impact on practice.

565 Full details of the evidence and the committee's discussion are in [evidence review G:
566 Tests for predicting outcomes after repair of unruptured abdominal aortic aneurysms](#)
567 and [evidence review H: Risk assessment tools for predicting surgical outcomes of
568 patients who undergo elective abdominal aortic aneurysm repair](#).

569 [Return to recommendations](#)

570 ***Predicting surgical outcomes in ruptured aneurysms***

571 Recommendations [1.4.4 and 1.4.5](#)

572 **Why the committee made the recommendations**

573 There is evidence that some risk factors and risk assessment tools are associated
574 with poor postoperative outcomes. However, it is not clear how any particular factor

575 or combination of factors could be used to decide if aneurysm repair is suitable for a
576 person with a ruptured AAA.

577 **How the recommendations might affect practice**

578 The recommendations will have a beneficial impact, by ensuring decisions about
579 care are not made based on inappropriate factors or tools. This, in turn, should
580 prevent inappropriate decisions being made about patient care.

581 Full details of the evidence and the committee's discussion are in [evidence review S:](#)
582 [Risk factors for predicting survival after AAA rupture](#).

583 [Return to recommendations](#)

584 ***Improving surgical outcomes***

585 Recommendations [1.4.6–1.4.9](#)

586 **Why the committee made the recommendations**

587 The committee made a recommendation on cardiovascular disease because it is
588 common in people with AAA and it is best practice to reduce the risk of problems in
589 people who have it.

590 The evidence showed that giving beta blockers just before surgery does not help,
591 and that they cause problems such as low blood pressure and a slow heartbeat. The
592 committee noted that some people with AAA may need to take beta blockers for
593 other conditions (such as atrial fibrillation). As a result, they recommended against
594 routine acute use before AAA repair, rather than recommending against beta
595 blockers altogether.

596 Remote ischaemic preconditioning was not recommended because there was
597 evidence that it does not improve outcomes and that it can cause problems such as
598 an irregular heartbeat.

599 The committee recommended further research because there was not enough
600 evidence to make recommendations on exercise programmes before surgery, or on
601 any interventions after AAA repair.

602 **How the recommendations might affect practice**

603 Providing support to reduce the risk of problems from cardiovascular disease is
604 already current practice. In addition, beta blockers and routine ischaemic
605 preconditioning are not currently in routine use before AAA repair, so these
606 recommendations should have a minimal impact on practice.

607 Full details of the evidence and the committee's discussion are in [evidence review J:
608 Pre- and postoperative interventions to optimise outcomes after abdominal aortic
609 aneurysm repair](#).

610 [Return to recommendations](#)

611 ***Repairing unruptured aneurysms***

612 Recommendations [1.5.1–1.5.6](#)

613 **Why the committee made the recommendations**

614 ***When to repair***

615 The committee noted that a number of factors are considered before treating
616 asymptomatic aneurysms; one of which is size. It is good practice to repair large
617 aneurysms (over 5.5 cm in diameter), and to monitor smaller aneurysms (less than 4
618 cm in diameter) until they become larger. There is some debate as to whether
619 aneurysms between 4 cm and 5.5 cm should be repaired immediately or whether
620 they should be monitored and only repaired when they become larger. Based on the
621 available evidence, the committee highlighted factors that would help healthcare
622 professionals decide when to repair aneurysms.

623 ***Which technique to use***

624 There is no evidence that EVAR for people with an unruptured infrarenal AAA
625 provides long-term benefit compared with open surgical repair. While EVAR is
626 associated with fewer perioperative deaths, it has more long-term complications, and
627 these complications mean that people will need further procedures. There is some
628 evidence that EVAR is associated with worse long-term survival than open surgical
629 repair. EVAR also has higher net costs than open surgical repair. The evidence

630 shows that, even if long-term benefits were achievable, they could not plausibly be
631 sufficient to outweigh these costs.

632 Open surgical repair is unsuitable for some people with an unruptured AAA because
633 of their anaesthetic risk and/or medical comorbidities. For these people, the risks of
634 their AAA rupturing, if no repair is attempted, have to be balanced against the
635 perioperative risks and long-term complications associated with EVAR. The evidence
636 shows that the average person receiving EVAR has an uncertain chance of a small
637 net benefit, compared with the large and certain increase in costs. Therefore, the
638 committee agreed that elective EVAR cannot be considered an effective use of NHS
639 resources in this population.

640 The evidence for complex EVAR was limited in quantity and quality. However,
641 complex EVAR grafts are much more expensive than standard devices, so the
642 difference in cost between EVAR and open surgical repair is even greater than in
643 infrarenal AAAs. The committee also noted that the instructions for use of the grafts
644 that are currently available do not cover complex AAAs. Although there is currently
645 no evidence that complex EVAR has better outcomes than open surgical repair,
646 people with complex AAAs have higher perioperative mortality rates. Because of
647 this, a perioperative survival benefit equivalent to that seen with EVAR for infrarenal
648 AAAs could potentially be more influential in complex AAAs. Therefore, the
649 committee agreed that more information would be helpful, so it recommended that
650 the use of complex EVAR should be restricted to randomised trials.

651 The committee also discussed complex EVAR for people for whom open surgical
652 repair is not a suitable option because of their anaesthetic risk and/or medical co-
653 morbidities. They agreed that, in this population, people who need complex EVAR
654 could not plausibly have better outcomes than those who need standard infrarenal
655 EVAR. As they had not recommended standard EVAR in this population, the
656 committee agreed that they could not recommend complex EVAR either. The
657 committee did not recommend using complex EVAR in randomised trials in these
658 circumstances, because it would be unethical to randomise people to a treatment
659 with a high risk of perioperative death when there is no prospect of long-term
660 benefits at reasonable cost.

661 For each of these recommendations, the committee considered whether there were
662 any specific groups that would benefit from standard or complex EVAR for
663 unruptured AAAs. They explored groups defined by age, sex, AAA diameter and life
664 expectancy, but there were no groups in which the benefits would outweigh the harm
665 and costs.

666 ***Goal-directed therapy***

667 The evidence did not show any benefit from goal-directed therapy for people having
668 repair of an unruptured AAA. Goal-directed therapy covers a broad range of different
669 haemodynamic monitoring and management practices, some of which are routinely
670 performed during major surgery. The committee recognised that it was not possible
671 to specify which practices should not be performed and agreed that drafting
672 recommendations would be too prescriptive.

673 **How the recommendations might affect practice**

674 The committee considered that the recommendation on when to repair unruptured
675 aneurysms is unlikely to impact on current clinical practice because it reflects what is
676 already being done within the NHS.

677 The recommendations on EVAR will have a large impact on practice, as EVAR is a
678 widely performed procedure. EVAR is currently used more frequently than open
679 surgical repair in some areas, so a diverse group of people both within and outside
680 the national screening programme will need to update their knowledge. The
681 recommendations will also affect the timing and type of information about treatment
682 options given to patients who are diagnosed with small-to-medium AAAs and are
683 being monitored for signs of growth. The recommendations will minimise harm by
684 reducing long-term mortality and the need for reintervention as a result of problems
685 with EVAR. Reductions in EVAR use and subsequent EVAR-related reinterventions
686 will lead to cost savings within the NHS.

687 A lack of recommendations on goal-directed therapy will not impact on practice.
688 Basic haemodynamic management is routinely performed during most surgical
689 procedures, but goal-directed therapy is rarely performed during AAA surgery.

690 Full details of the evidence and the committee's discussion are in [evidence review F:](#)
691 [Thresholds for abdominal aortic aneurysm repair](#) and [evidence review K:](#)
692 [Effectiveness of endovascular aneurysm repair, open surgical repair and non-](#)
693 [surgical management of unruptured abdominal aortic aneurysms](#).

694 [Return to recommendations](#)

695 ***Anaesthesia and analgesia during unruptured aneurysm repair***

696 Recommendation [1.5.7](#)

697 **Why the committee made the recommendations**

698 The committee noted that there was some evidence that adding an epidural to
699 general anaesthesia reduced the need for further analgesia for people having open
700 repair of an unruptured AAA. This was consistent with their own clinical experience
701 of better pain control with an epidural. Adding an epidural is fairly widespread in
702 current practice, and the committee agreed that it should be recommended as an
703 option.

704 No evidence was found on anaesthesia and analgesia for people undergoing EVAR
705 for unruptured AAA. The committee agreed that no recommendations were needed
706 in this area because they had recommended that EVAR should not be used to treat
707 unruptured infrarenal aneurysms.

708 **How the recommendations might affect practice**

709 The use of an epidural in addition to general anaesthesia for people having open
710 repair of an unruptured AAA is already fairly widespread in current practice.
711 Therefore the overall impact of the recommendation is likely to be small, although it
712 may reduce existing variation.

713 Full details of the evidence and the committee's discussion are in [evidence review L:](#)
714 [Anaesthesia and analgesia for people having surgical repair of an abdominal aortic](#)
715 [aneurysm](#).

716 [Return to recommendations](#)

717 ***Repairing ruptured aneurysms***

718 Recommendations [1.6.1–1.6.3](#)

719 **Why the committee made the recommendations**

720 ***Which technique to use***

721 The evidence showed that, compared with open surgical repair, a strategy that uses
722 EVAR (where anatomically possible) to repair ruptured infrarenal AAAs provides a
723 reasonable balance of benefits and costs.

724 As the average cost-effectiveness results for EVAR were favourable, the committee
725 discussed whether they should recommend EVAR whenever it is possible. They
726 decided not to, for 2 reasons.

727 Firstly, there is uncertainty in the evidence for EVAR. People who had EVAR for a
728 ruptured AAA were followed up for at most 7 years. People who had EVAR for an
729 unruptured AAA were followed up for 15 years, and the committee noted that these
730 data suggested that EVAR may be worse than open surgical repair in the long run
731 (see [why the committee made the recommendations on repairing unruptured](#)
732 [aneurysms](#)). There are some signs that a similar long-term pattern may develop in
733 trials of ruptured AAA, so it is possible that longer-term data would show EVAR to be
734 worse than open surgical repair for people with ruptured AAA as well.

735 Secondly, there was evidence that the balance of benefits and costs of EVAR varies
736 between different groups of people with ruptured AAA. In particular, women clearly
737 have better short-term survival after EVAR, whereas the evidence favours open
738 surgical repair for younger men. Therefore, the committee recommended that either
739 EVAR or open repair can be considered, and provided detail on the groups for which
740 each approach is likely to be best.

741 Complex EVAR is only recommended within the context of an RCT because there is
742 currently no evidence to support it as an option for people with ruptured complex
743 AAA.

744 ***Tranexamic acid***

745 No evidence on the use of tranexamic acid in people with a ruptured AAA was
746 identified. The committee was aware that tranexamic acid is included in some major
747 haemorrhage protocols and some patients, without major trauma, may receive it
748 before undergoing surgery. In the committee's experience, tranexamic acid is not
749 routinely used in people with a ruptured AAA, so it agreed to recommend research in
750 this area.

751 ***Goal-directed therapy***

752 There was no evidence on goal-directed therapy for people having repair of a
753 ruptured aneurysm. Goal-directed therapy covers a broad range of different
754 haemodynamic monitoring and management practices; some of which are routinely
755 performed during major surgery. The committee recognised that it was not possible
756 to specify which practices should not be performed and agreed that drafting
757 recommendations would be too prescriptive.

758 **How the recommendations might affect practice**

759 The recommendations will have little impact on current practice, as both standard
760 EVAR and open surgery are currently offered to people with ruptured infrarenal AAA.
761 In relation to complex EVAR, the recommendation not to use it outside of
762 randomised trials will limit the use of a technically complex and expensive procedure
763 in people for whom open surgery is a safe and suitable option.

764 A lack of recommendations on goal-directed therapy will not impact on practice.
765 Basic haemodynamic management is routinely performed during most surgical
766 procedures, but goal-directed therapy is rarely performed during AAA surgery.

767 A lack of recommendations on tranexamic acid will have little impact on practice.
768 Tranexamic acid is used in varying degrees across the NHS, but it is not standard
769 practice for people with ruptured or symptomatic AAAs who are being transferred
770 prior to surgery.

771 Full details of the evidence and the committee's discussion are in [evidence review T:
772 Effectiveness of endovascular aneurysm repair compared with open surgical repair
773 of ruptured abdominal aortic aneurysms](#).

774 [Return to recommendations](#)

775 ***Anaesthesia and analgesia during ruptured aneurysm repair***

776 Recommendation [1.6.4](#)

777 **Why the committee made the recommendations**

778 No evidence was identified on the optimal use of anaesthesia and analgesia in
779 people having open surgical repair or EVAR of a ruptured AAA. The committee
780 agreed, based on their knowledge and experience, that general anaesthesia alone is
781 widely accepted as best practice for open repair. With this in mind, it did not make a
782 recommendation on this. It made a recommendation on the use of local infiltrative
783 anaesthesia alone in people having EVAR for ruptured AAA because some
784 anaesthetists are not aware that it is a valid option in this patient group.

785 **How the recommendations might affect practice**

786 The committee agreed that the potential impact of this recommendation on practice
787 is unclear, because it is difficult to predict the proportion of people for whom EVAR
788 under local infiltrative anaesthesia might be an option. The main aim of this
789 recommendation is to raise awareness of this option among anaesthetists.

790 Full details of the evidence and the committee's discussion are in [evidence review L:
791 Anaesthesia and analgesia for people having surgical repair of an abdominal aortic
792 aneurysm](#).

793 [Return to recommendations](#)

794 ***Abdominal compartment syndrome***

795 Recommendations [1.6.5 and 1.6.6](#)

796 **Why the committee made the recommendations**

797 There was no evidence relating to preventing or managing abdominal compartment
798 syndrome in people who are having surgery to repair a ruptured AAA. The
799 committee agreed it was important to raise awareness of this potentially life-
800 threatening condition, and made recommendations to highlight that it can occur after
801 both endovascular aneurysm repair and open surgical repair.

802 **How the recommendations might affect practice**

803 The recommendations will ensure that clinicians are aware of abdominal
804 compartment syndrome in people who have undergone repair of ruptured AAA. This
805 may result in better postoperative assessment and management.

806 Full details of the evidence and the committee's discussion are in [evidence review U:
807 Preventing abdominal compartment syndrome following repair of ruptured abdominal
808 aortic aneurysm](#).

809 [Return to recommendations](#)

810 ***Monitoring for complications after endovascular aneurysm repair***

811 Recommendations [1.7.1–1.7.5](#)

812 **Why the committee made the recommendations**

813 Imaging surveillance after endovascular repair (EVAR) is good practice, because
814 there is a risk that people will develop complications from the procedure or need
815 another operation. These risks are lower after open surgery, so surveillance is not
816 standard practice and in this case the committee did not recommend it.

817 The committee noted the frequency of EVAR surveillance is highly variable in
818 practice. In the absence of evidence on how often imaging should be done, the
819 committee agreed a recommendation to tailor surveillance to the perceived risk of
820 complication. This should maximise attention for those patients at greatest risk, and
821 help to identify complications earlier.

822 Since there is a lack of evidence on surveillance programmes for people who have
823 had EVAR, the committee recommended further research in this area.

824 Contrast-enhanced CT angiography is the gold standard test for imaging surveillance
825 after EVAR. The identified evidence demonstrated that no other imaging technique
826 had acceptable accuracy at identifying endoleaks in comparison with contrast-
827 enhanced CT angiography. Importantly, other imaging techniques had higher rates
828 of false-negative results. Although there was little or no evidence on graft kinking,
829 occlusion, or migration, the committee agreed that contrast-enhanced CT
830 angiography was the best imaging technique for detecting these types of

831 complications, based on their clinical experience. Overall, they agreed that contrast-
832 enhanced CT angiography should be the preferred test for imaging surveillance after
833 EVAR but noted that it may be unsuitable for some people, for example people who
834 are allergic to the contrast agent or have renal failure. In this case, contrast-
835 enhanced ultrasound is more likely than other suitable tests to identify endoleaks.
836 Contrast-enhanced ultrasound was not recommended for assessing for other
837 complications because the evidence only covered endoleaks.

838 The committee agreed that it is particularly important not to miss these
839 complications, so the sensitivity of a test is more important than its specificity. Colour
840 duplex ultrasound does not adequately rule out endoleaks, and in particular has poor
841 sensitivity for type I and III endoleaks, so the committee agreed that it cannot be
842 recommended as a first-line surveillance test. In addition, the evidence showed that
843 the accuracy of the test was dependent on the ultrasound operator, so the accuracy
844 will be highly variable in practice. The high variability in diagnostic accuracy, and
845 resultant potential for harm, led the committee to recommend that the test should not
846 be used as the main imaging technique to detect endoleaks. However, the
847 committee agreed based on their experience that it can be a useful follow-up test for
848 evaluating abnormalities identified on surveillance imaging.

849 **How the recommendations might affect practice**

850 The recommendations on surveillance programmes and frequency of surveillance
851 reflect current practice, so organisations are unlikely to need to change practice.

852 There is variation in which imaging techniques are used for surveillance. Some
853 centres use ultrasound only, and some use contrast-enhanced CT angiography and
854 ultrasound. Colour duplex ultrasound is widely used, but contrast-enhanced
855 ultrasound is not. Therefore, there will be infrastructure and training costs for centres
856 that are not using the imaging techniques recommended here. In particular,
857 sonographers will need training on cannulation and administering contrast agents.

858 Full details of the evidence and the committee's discussion are in [evidence review V:](#)
859 [Postoperative surveillance after surgical repair of abdominal aortic aneurysms](#) and
860 [evidence review W: Accuracy of imaging techniques in identifying complications after](#)
861 [surgery](#).

862 [Return to recommendations](#)

863 ***Managing endoleaks after endovascular repair***

864 Recommendations [1.8.1–1.8.3](#)

865 **Why the committee made the recommendations**

866 Endoleak following EVAR is common, and can have a negative impact on patient
867 prognosis and long-term quality of life. In the absence of evidence, the committee
868 made recommendations based on their experience because:

- 869 • it is good practice to repair type I and III endoleaks and some type II endoleaks
- 870 • healthcare professionals are not all aware that type II endoleaks without sac
871 expansion can be managed conservatively
- 872 • there are circumstances when sac expansion occurs without imaging evidence of
873 a leak site (called type V endoleak), and these situations need further
874 investigation.

875 **How the recommendations might affect practice**

876 The recommendations will have minimal impact on current practice as it is common
877 practice to intervene for type I and type III endoleaks, and type II endoleaks if there
878 is evidence of aneurysm sac expansion.

879 Full details of the evidence and the committee's discussion are in [evidence review X:
880 *Managing complications after abdominal aortic aneurysm repair*](#).

881 [Return to recommendations](#)

882 **Context**

883 Aortic aneurysms develop when the wall of the aorta weakens, causing it to bulge
884 and form a balloon-like expansion. When this occurs in the abdomen and the aorta
885 reaches a diameter at least 1.5 times the normal, or greater than 3 cm in total, it is
886 called an abdominal aortic aneurysm (AAA).

887 The stretching and increased wall tension may eventually cause the aneurysm to
888 rupture. The subsequent internal bleeding is fatal before emergency repair can be

889 attempted in 80% of people. Even when people have emergency repair, only about
890 half of them survive beyond 30 days.

891 There is a long period of growth before an AAA reaches this life-threatening state.
892 The rate of growth may depend on a number of factors, including increasing age,
893 smoking, blood pressure and a family history of aneurysm.

894 Because most AAAs are asymptomatic, it is difficult to establish their prevalence.
895 Screening studies in the UK have estimated a prevalence of between 1.3 and 12.7%,
896 depending on the age group studied and the definition of AAA. AAAs are most
897 frequent in men over 65. In this group, AAA rupture causes 3,000 deaths, or 1.7% of
898 deaths, each year in England and Wales.

899 Most AAAs are diagnosed opportunistically during clinical examination or
900 investigation for another condition, although there is a national screening programme
901 for AAA which enrolls men at age 65.

902 Although the incidence of abdominal aortic aneurysms is approximately 6 times
903 lower in women, the rate of aneurysm rupture is significantly higher. The guideline
904 committee carefully considered the impact of their recommendations on women
905 during guideline development.

906 **Finding more information and resources**

907 To find out what NICE has said on topics related to this guideline, see our web page
908 on [aortic aneurysms](#).

909